



Space Launch System

Highlights

October 2012



NASA Building a Better Solid Rocket Booster for Space Launch System Rocket

The largest and most powerful solid rocket booster ever built for flight is being assembled for NASA's Space Launch System (SLS) at ATK Space Systems in Promontory, Utah, incorporating new cost-savings measures into development. The SLS will launch NASA's Orion spacecraft and other payloads beyond low Earth orbit, providing an entirely new capability for human exploration deep into space.

Although similar to the solid rocket boosters that helped power the space shuttle to orbit, the five-segment SLS boosters include several upgrades and improvements implemented by NASA and ATK engineers. In addition, the SLS boosters will be built more affordably and efficiently than shuttle boosters, incorporating new and innovative processes and technologies.

"By improving upon proven space shuttle solid rocket motor hardware and operations, our shared goal is to deliver



ATK employees at the company's Promontory, Utah, facility prepare a segment of a qualification motor for NASA's Space Launch System for transport. *(Credit: ATK)*

a safe, affordable and sustainable launch vehicle," said Alex Priskos, SLS Booster manager at NASA's Marshall Space Flight Center in Huntsville, Ala. "We are embracing innovation both technically and in our management processes as we design and build SLS. Through the use of new streamlined approaches and techniques, we have been able to drive down costs and enhance the reliability of the hardware."

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Space Launch System Providing Engine ‘Brains’ with an Upgrade



During a recent tour for Space Launch System Program managers, Mike Kynard, manager of the program's Liquid Engines office, explains how test personnel use working parts from an RS-25 engine to test the new engine control unit at Marshall Space Flight Center test facilities. (Credit: NASA/MSFC)

Engineers with NASA's Space Launch System Program (SLS), managed at the Marshall Space Flight Center in Huntsville, Ala., will use the proven RS-25 engine, the space shuttle's main engine (SSME) during its 30-year history, to power the massive SLS rocket's core stage. The RS-25, designed and developed with NASA by Pratt & Whitney Rocketdyne of Canoga Park, Calif., and launched on 135 shuttle missions, is a crucial part to the core stage design, but a few enhancements to the engine control unit are being developed at the Marshall Center.

"The computer controlling the SSME was manufactured in the early '80s and many parts are now obsolete," said Jeremy Richard, SLS Liquid Engines Office Subsystem manager. "While working on updating the technology, we discovered we could adapt the same controller being used by the new J-2X engine to the RS-25 engine, effectively streamlining the controller and resulting in a cost savings."

The engine controller unit allows communication between the vehicle and the engine, sending commands down to the engine and transmitting data back to the vehicle. The controller also provides closed loop management of the engine by regulating thrust and fuel mixture ratio while monitoring the engine's health and status.

SLS engineers at the Marshall Center are currently testing the same basic hardware design to control multiple engines. With a common physical design and just a few card change outs, the same unit could control multiple individual engine designs, including future designs, at half the cost of a space shuttle main engine controller.

For a closer look at a recent test of the RS-25 engine controller unit, visit:

http://www.nasa.gov/multimedia/videogallery/index.html?media_id=154074051

Solid Rocket Booster

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New process improvements have been implemented throughout the manufacturing of Qualification Motor-1, the next full-scale test article for the SLS booster. Four case segments have now been cast, and the motor will begin assembly in the test stand next month in preparation for a ground test in the spring of 2013.

For a video and examples of these process improvements visit:

http://www.nasa.gov/exploration/systems/sls/sls_qualification.html

First Space Launch System ‘Pathfinder’ Hardware Nearing Completion

Engineers using a state-of-the-art vertical welding tool at the Marshall Space Flight Center in Huntsville, Ala., move a “pathfinder” version of the adapter design that will be used on test flights of the Orion spacecraft and NASA’s Space Launch System (SLS). The adapter will eventually connect the Orion spacecraft to the SLS. It will be flight tested on Exploration Flight Test-1 in 2014, when it will be used to mate Orion to a Delta IV heavy-lift rocket. The term “pathfinder” refers to an early version of the hardware that is not intended to fly, but to prove the concept and feasibility of manufacturing the design. This pathfinder is 18 feet across and 5 feet tall and will be strengthened in a few weeks when specially machined end rings — also built at the Marshall Center — are welded to it. The SLS will launch NASA’s Orion spacecraft and other payloads beyond low Earth orbit, providing an entirely new capability for human exploration. The Marshall Center manages the SLS Program for the agency and works closely with the Orion program office at NASA’s Johnson Space Center in Houston and the Ground Systems Development and Operations Program, which manages the operations and launch facilities at NASA’s Kennedy Space Center in Florida. *(Credit: NASA/MSFC)*



NASA Awards SLS Advanced Booster Contracts

NASA awarded three contracts in September totaling \$137.3 million to improve the affordability, reliability, and performance of an advanced booster for the Space Launch System (SLS). The awardees will develop engineering demonstrations and risk reduction concepts for a future version of the SLS, a heavy-lift rocket for scientific exploration beyond low Earth orbit.

The initial 70-metric-ton SLS configuration will use two five-segment solid rocket boosters similar to the boosters that helped power the space shuttle to orbit. The evolved 130-metric-ton SLS vehicle will require an advanced booster with more thrust than any existing U.S. liquid- or solid-fueled boosters. These new initiatives will demonstrate and examine advanced booster concepts and hardware demonstrations during a 30-month period.

The companies selected for SLS Advanced Booster contracts are ATK Launch Systems Inc. of Promontory, Utah; Dynetics Inc. of Huntsville, Ala.; and Northrop Grumman Corporation Aerospace Systems of Redondo Beach, Calif.

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SLS Advanced Booster Contracts

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Details of the individual contract awards are provided in the captions below, accompanying artist renditions of their projects.

Additional contracts may be awarded following successful negotiation of other proposals previously received for this NASA Research Announcement (NRA), subject to funding availability.

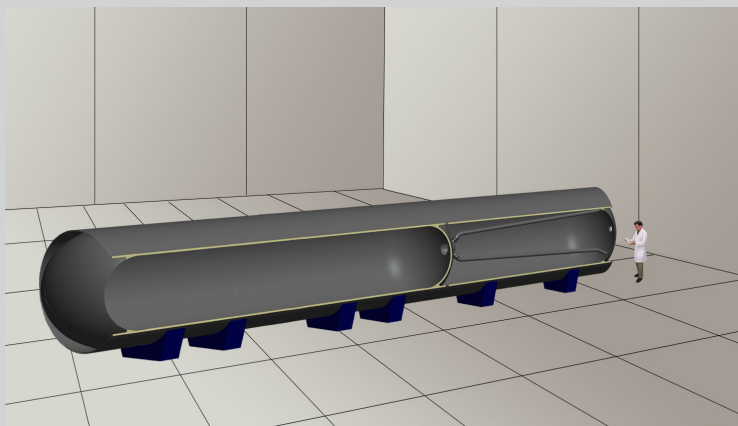
These new contracts are funded under an NRA risk mitigation effort and acquisition. There will be a future competition for design, development, testing, and evaluation for the SLS advanced booster. This future competition is planned for 2015 and will be acquired through a separate solicitation. The 2015 competition will not be limited to awardees announced in this NRA. Successful offerors to this NRA are not guaranteed an award for any future advanced booster acquisition.



ATK Launch Systems will demonstrate innovations for a solid-fueled booster. The contract addresses the key risks associated with low-cost solid propellant boosters, particularly in the areas of composite case design and development; propellant development and characterization; nozzle design and affordability enhancement; and avionics and controls development. (Credit: ATK)



Dynetics will demonstrate the use of modern manufacturing techniques to produce and test several primary components of the F-1 rocket engine originally developed for the Apollo Program, including an integrated powerpack, the primary rotating machinery of the engine. Additionally, the contract will demonstrate innovative fabrication techniques for metallic cryogenic tanks. (Credit: Dynetics)



Northrop Grumman will demonstrate innovative design and manufacturing techniques for composite propellant tanks with low fixed costs and affordable production rates. Independent time and motion studies will compare demonstration affordability data to SLS advanced booster development, production, and operations. (Credit: Northrop Grumman)

Von Braun Symposium



Dan Dumbacher, NASA's deputy associate administrator for Exploration Systems Development, moderates a panel titled "NASA Human Space Exploration Plans and Update" at the 5th Von Braun Memorial Symposium at the University of Alabama in Huntsville on Oct. 16. Featured panelists included, seated from left, Space Launch System Program Manager Todd May from the Marshall Space Flight Center, Orion Crew and Service Module Manager Charlie Lundquist from the Johnson Space Center, and Chief Architect of the Ground Systems Development and Operations Program Scott Colloredo from the Kennedy Space Center. (Credit: NASA)



Todd May, manager of NASA's Space Launch System (SLS) program at the Marshall Center, presents an SLS program update at the Von Braun Memorial Symposium on Oct. 16. "The three programs represented here today — SLS, the Orion crew module, and ground operations at the Kennedy Space Center — are national assets," May said. "The success of the Space Launch System will enable advances in science and human exploration as well as commerce and industry. These programs are an investment in the future." (Credit: NASA)

SLS Industry Day at Michoud Assembly Facility



Todd May, Space Launch System (SLS) Program manager, updates the progress of the rocket program to business representatives during SLS Industry Day at the Michoud Assembly Facility (MAF) in New Orleans on Oct. 24. Other NASA personnel pictured here giving SLS updates include Chris Crumbly, SLS Advanced Development manager; Mike Kynard, SLS Liquid Engines manager; and Tony Lavoie, SLS Stages manager. More than 170 people attended, representing 90 companies across 19 states. Attendees also got an overview of MAF capabilities and construction of facilities, SLS acquisition, the Orion spacecraft, Marshall Space Flight Center Partnerships Office, Marshall Center Strategic Development, and Stennis Space Center capabilities. With 43 acres under one roof, MAF has a rich history in spaceflight manufacturing, from the Saturn V to the external tanks of the Space Shuttle Program. The MAF workforce begins the next chapter of human spaceflight support by building the Orion composites and the SLS core stage. The SLS Program and MAF are managed at the Marshall Space Flight Center. (Image: NASA/MAF)

SLS Education and Public Outreach

A member of the SLS Education and Public Outreach (EPO) team discusses the finer points of the heavy-lift rocket with an attendee at the Association of Science-Technology Centers annual conference held Oct. 12–16 in Columbus, Ohio. The EPO team provided DVDs, high-resolution images, and other SLS resources for use in museums, science-technology centers, and a variety of informal education venues. SLS also joined other NASA programs to give brief presentations at one of the panels titled “What’s Next in Human Spaceflight?” The international conference drew approximately 1,600 visitors from the United States, Canada, Mexico, Europe, and Asia. *(Credit: NASA/MSFC)*



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